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(54) **An animal feed**

(57) An animal feed comprises oil palm fronds which have been compressed into a compact form for eating by animals. The compressed feed may be sealed to keep it green, and may include nutritional additives for example calcium, iron.

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AN ANIMAL FEED

This invention relates to an animal feed and to a method of producing the animal feed.

Various types of palm tree are known. One of these palm trees is known as the oil palm. The oil palm is also known by its scientific name of *elaeis guineensis*.

The oil palm is widely grown in tropical countries and palm oil is made from the fruits of the oil palm. The palm oil is widely used for industrial and food purposes. In contrast, the fronds of the oil palm have not been used and they have hitherto been regarded as having no commercial use. As is well known, the fronds of the oil palm are the leaf like members or branches of the oil palm and which are composed of a rachis or stem from which elongate leaflets extend.

It is an aim of the present invention to utilise the oil palm fronds for a commercial purpose.

Accordingly, this invention provides an animal feed comprising oil palm fronds which have been compressed into a compact form for eating by animals.

The animal feed is especially useful for livestock such for example as cows, sheep, goats, chickens and horses.

The oil palm fronds are rich in fibre and they are also rich in natural vitamin E, both of which are essential for healthy animals. Animals are often presently fed high

protein animal feeds in order to cause the animals to grow quickly. However such high protein animal feeds often cause serious stomach inflammations in the animals.

5 A proper fibre diet is desirable in order to help to offset the disadvantage of feeding high protein animal feed to the animals. The animal feed of the present invention admirably suits this purpose with its fibre rich content as well as its natural vitamin E content.

10 Preferably, the animal feed is one in which the oil palm fronds have been compressed into pellets, cubes or wafers. The animal feed may however take other forms if desired.

15 When the animal feed is in the form of pellets, then the pellets may be 15mm in diameter and 30mm in length. Obviously the size and shape of the pellets may be varied for different types of animals as may be appropriate.

Usually, the fronds will be cut and compressed.

20 The animal feed may include more rachis than is normally present in complete fronds. The increased rachis content may be provided by stripping all or some of the leaflets from some of the fronds and using these stripped or partially stripped fronds in the animal feed, mixed with normal fronds.

25 Advantageously, the compressed animal feed is sealed to keep the compressed animal feed green. Such sealed animal feed can then easily form a substitute for the normal green feed of the animals.

The animal feed may include nutritional additives. Any suitable and appropriate nutritional additives may be included such for example as calcium and/or iron.

The present invention also provides a method of producing the animal feed, which method comprises compressing oil palm fronds into a compact form for eating by animals.

In the method of the invention, the oil palm fronds may be cut and compressed and they will usually be formed into pellets, cubes or wafers.

The invention will now be further illustrated with reference to the following Example which is given for the purposes of illustration only.

EXAMPLE

Oil palm fronds from oil palms were gathered. The gathered fronds were washed in water. The washed fronds were then placed in appropriate apparatus which compressed and cut the fronds, the cut fronds being compressed into relatively large blocks for transportation. This enabled the fronds to be made into an easily transported form at the site where they were collected.

The fronds in the form of the blocks were then taken to a pelletizing plant and they were introduced to a pelletizing machine. In the pelletizing machine, the fronds are cut into fine pieces. The finely cut pieces then form a paste due to the pressure applied within the pelletizing

machine. The pelletizing machine applies a substantially constant pressure which may be 10-15 kg/cm<sup>2</sup> in pressure. The processing temperature is 80-120° C. The pelletizing machine was powered by a 15 horse power 11.25 kilowatt electric motor which was able to cause the pelletizing machine to operate at a minimum capacity of 150 kg of the compressed animal feed per hour.

Under the applied pressure and temperature, the fronds secreted farinaceous material to solidify the paste into pellets. Such self-solidification from the paste facilitated the formation of the pellets without the need for pellet-forming chemicals or additives. Thus the formed pellets constituted a totally natural animal feed.

The formed animal feed pellets were green. The pellets retained their green colour for a long time. The green was sealed into the pellets during the production of the pellets.

The gathering of the oil palm fronds is easily effected on those estates growing oil palms in tropical countries. When the oil palm fruits are taken from the oil palm trees, approximately three or four fronds must also be taken off at the same time in order to enable the fruits to be gathered in a complete bunch. The oil palm fruits are actually taken from the trees using special knives. The discarded cut fronds can then be gathered for use in the

present invention. Approximately 12 kilograms per adult of gathered fronds may be obtained each day. In tropical countries, oil palm fruits can be harvested through the entire year, depending upon harvesting schedules of plantations. Thus a continuous supply of oil palm fronds may be obtained throughout the year.

Oil palm fronds have been analysed to show that the leaflets of the fronds contain 14.3% of fibre. The rachis of each frond obviously contains more fibre so that the total fibre content of an entire frond is quite substantial. The fibre content in the rachis is greatest at the root of the rachis.

There is given hereinbelow an analysis of the oil palm leaflets only, that is without the rachis being analysed.

ANALYSIS OF OIL PALM LEAFLETS OF OIL PALM FRONDS

Water	54.3% by weight	By normal heat dry
Crude Protein	5.2% by weight	By Kjeldahl method
Crude Fat	2.3% by weight	By Ether Extraction
Fibres	14.3% by weight	By Filtering Method
Rough Ash	3.7% by weight	By Direct Ashing
Total Carotene	19.5mg/100 g	By optical absorbance
Total Tocopherols (Vitamin-E)	221 mg/100 g	By high performance liquid chromatography
$\alpha$ - Tocopherol	220 mg/100 g	
$\beta$ - Tocopherol	untraceable	
$\gamma$ - Tocopherol	1 mg/100 g	
$\delta$ - Tocopherol	untraceable	

The most important vitamin E referred to in the above table is  $\alpha$  - tocopherol which contributes substantially to the activation of cellular tissue. Usually, general references to vitamin E are usually equivalent to references to  $\alpha$  - tocopherol as the  $\beta$ ,  $\gamma$  and  $\delta$  tocopherols are not usually needed. As can be seen from the above table, the  $\alpha$  - tocopherol is present in 220 mg/100 g, which constitutes 99.55 % of the total tocopherol present.

The present invention provides a very good source of fibre and also a very good source of vitamin E for animals as mentioned above. The animal feed is especially useful for cows who cannot create vitamin E themselves and they therefore need to be given vitamin E. The animal feed of the present invention has a good total digesting nutrition value. More specifically, the total digesting nutrition value of the animal feed may be 40% better than many known feeds so that the animal feed of the present invention can compete successfully with the total digesting nutrition value of alfalfa which gives substantially the same value as the animal feed of the present invention. As is well known, alfalfa is a widely used grass feed but it does not contain vitamin E.

In the above Example, the animal feed was produced in the form of pellets. The animal feed can however be

produced in other forms such for example as cubes and wafers. The pellets were however able to keep their green colour longer than cubes and wafers.

5 An advantage of the compressed animal feed is that it does not require to be kept in silos which saves on storage space and is thus beneficial for animal owners. The pellets can be produced on a production run to have a feed content of 30% as against the quantity of oil palm fronds initially supplied. Such a production yield can be  
10 regarded as excellent.

The pelletizing machine referred to in the Example can be increased in size to give greater commercial production capacity.

15 If desired, the fronds may be mixed with nutritional additives in order to form more complex animal feeds. Any desired types of nutritional additives may be employed such for example as calcium and iron. Generally the nutritional additives will be designed to promote the healthy growth of the animals. The percentage of nutritional additives  
20 employed may be determined by an animal owner's choice so that the animal feed can be custom produced to the choice of particular animal owners.

It will be appreciated from the above that a beneficial animal feed can be produced which is advantageous for keeping



the stomachs of animals healthy. The animal feed can be produced to be a totally natural feed or synthetic nutritional additives may be employed if desired.

CLAIMS

1. An animal feed comprising oil palm fronds which have been compressed into a compact form for eating by animals.

2. An animal feed in which the oil palm fronds have been compressed into pellets, cubes or wafers.

3. An animal feed according to claim 1 or claim 2 in which the fronds are cut and compressed.

4. An animal feed according to any one of the preceding claims in which the compressed animal feed is sealed to keep the compressed animal feed green.

5. An animal feed according to any one of the preceding claims and including nutritional additives.

6. An animal feed according to claim 5 in which the nutritional additives include calcium and/or iron.

7. An animal feed substantially as herein described with reference to the accompanying Example.

8. A method of producing an animal feed as claimed in any one of the preceding claims, which method comprises

compressing oil palm fronds into a compact form for eating by animals.

9. A method according to claim 8 in which the oil palm fronds are cut and compressed.

5 10. A method of producing as animal feed, substantially as herein described with reference to the Example.

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